

# Missed Appointments in Resident Continuity Clinic: Patient Characteristics and Health Care Outcomes

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## Abstract

**Background** Frequent missed patient appointments in resident continuity clinic is a well-documented problem, but whether rates of missed appointments are disproportionate to standard academic practice, what patient factors contribute to these differences, and health care outcomes of patients who frequently miss appointments are unclear.

**Methods** The overall population for the study was composed of patients in an academic internal medicine continuity clinic with 5 or more office visits between January 2006 and December 2008. We randomly selected 325 patients seen by resident physicians and 325 patients cared for by faculty. Multivariate linear regression was used to examine the relationship between patient factors and missed appointments. Health outcomes were compared between patients with frequent missed appointments and the remainder of the study sample, using Cox regression analysis.

**Results** Resident patients demonstrated significantly higher rates of missed appointments than faculty patients, but this difference was explained by patient factors. Factors associated with more missed appointments included use of a medical interpreter, Medicaid insurance, more frequent emergency department visits, less time impanelled in the practice, and lower proportion of office visits with the primary care provider. Patients with frequent missed appointments were less likely to be up to date with preventive health services and more likely to have poorly controlled blood pressure and diabetes.

**Conclusions** We found that the disproportionate frequency of missed appointments in resident continuity clinic is explained by patient factors and practice discontinuity, and that patients with frequent missed appointments demonstrated worse health care outcomes.

## Introduction

Continuity clinic is a mandatory component of resident education to allow residents to learn outpatient disease management in the context of prevention and health promotion, while providing them opportunity to build longitudinal relationships with their patients.<sup>1</sup> Missed patient appointments in continuity clinic is a well-documented problem, resulting in discontinuity, disrupted schedules, and lost learning opportunities for residents to

see the outcome of their treatment plans.<sup>2-7</sup> Whether rates of missed appointments are disproportionate to standard academic practice, and what patient factors (if any) contribute to these differences is not clear.

Previous studies have demonstrated that patients who frequently miss appointments tend to be younger, of lower socioeconomic status, have a history of missed appointments, and have government-provided insurance.<sup>8-11</sup> Yet little is known about the health care outcomes of patients who frequently miss appointments. We compared missed appointment rates in resident and faculty primary care practices, evaluated patient characteristics associated with missed appointments, and ascertained health care outcomes of patients with frequent missed appointments. These results will be used to inform quality improvement initiatives aimed at reducing rates of missed appointments in continuity clinic.

## Methods

### Setting and Study Sample

This study was conducted in the primary care internal medicine (PCIM) clinics at Mayo Clinic Rochester, an academic practice where patients are assigned to either a faculty member or resident as their primary care provider.

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**TABLE 1** **COMPARISON OF MISSED APPOINTMENTS AND DEMOGRAPHIC FACTORS BETWEEN RESIDENT AND FACULTY PATIENTS IN AN ACADEMIC INTERNAL MEDICINE PRACTICE, 2006–2008**

	Faculty Patients (n = 325)	Resident Patients (n = 325)	P
No. of total visits	2682	3605	<.001
Missed appointments, %, mean $\pm$ SD	4.4 $\pm$ 8.0	12.9 $\pm$ 14.2	<.001
Age, y, mean $\pm$ SD	59.2 $\pm$ 18.1	43.3 $\pm$ 17.2	<.001
Women, %	40.9	43.1	.49
No. of emergency department visits, mean $\pm$ SD	2.1 $\pm$ 3.5	4.1 $\pm$ 4.1	<.001
No. of hospitalizations, mean $\pm$ SD	0.9 $\pm$ 1.9	0.9 $\pm$ 1.9	.75
No. of active prescriptions, mean $\pm$ SD	5.2 $\pm$ 2.5	4.9 $\pm$ 3.8	.35
Proportion of office visits with assigned primary care provider, %, mean $\pm$ SD	82.6 $\pm$ 17.4	56.1 $\pm$ 22.7	<.001
Use of interpreter, %	3.7	23.7	<.001
Duration in PCIM clinic, y, mean $\pm$ SD	8.3 $\pm$ 3.9	3.6 $\pm$ 2.5	<.001
Type of insurance, No. (%)			
Private	146 (44.9)	202 (62.1)	<.001
Medicaid	31 (9.5)	76 (23.3)	
Medicare	148 (45.5)	47 (14.4)	

Abbreviation: PCIM, primary care internal medicine.

PCIM includes 38 faculty physicians and 96 internal medicine residents, divided equally across all 3 years of training, who collectively care for more than 39 000 patients. Faculty physicians spend most of their time seeing their own impanelled patients, and most supervise resident continuity clinic one half-day per week. During the study interval, each resident saw patients in clinic one half-day per week for 10 months of the year plus burst continuity experiences for 1 month during his or her first and third years. Residents have a 93% fill rate and see an average of 157 patients in an academic year (3.6 visits per half-day).

After approval by the Institutional Review Board, all PCIM patients who had 5 or more office visits between January 1, 2006, and December 31, 2008, were identified, and subsets of 325 patients impanelled to resident providers and 325 patients impanelled to faculty providers were randomly selected for evaluation. A missed appointment was defined as a scheduled PCIM visit that was neither attended by the patient nor previously canceled. The number of missed appointments, demographic information, patient characteristics, and practice characteristics of this sample were retrieved by manual chart review.

### Health Outcome Measurements

Three health outcome domains were evaluated in the study sample: completion of age-appropriate preventive health

services, glycemic control among patients with diabetes, and blood pressure control. Age-appropriate preventative services as recommended by the US Preventive Services Task Force<sup>12</sup> were extracted by chart review. Patients who lacked at least 2 of these preventive services as of December 30, 2008, were defined as not being up to date. At the time of the study, the American Diabetes Association recommended glycemic control to target hemoglobin A1c (HgbA1c) <7%.<sup>13</sup> We defined poor diabetic control as having at least 2 HgbA1c >7% during the time period 2006–2008. Poorly controlled blood pressure was defined as having at least 2 separate systolic pressures  $\geq 160$  and/or diastolic pressures  $\geq 100$  (stage 2 hypertension).<sup>14</sup>

### Statistical Analysis

Baseline characteristics were compared between faculty and resident patients using the Student *t* test. Linear multiple regression analysis was performed to compare the rate of missed appointments between the faculty and resident patients, controlling patient characteristics. Patients who missed appointments  $\geq 20\%$  of the time or had  $\geq 5$  missed appointments during the study interval were characterized as a “frequent missed appointments” group. Health outcomes were compared between the frequent missed appointments group and the remainder of the study sample using Cox regression analysis.

**TABLE 2** COMPARISON OF DEMOGRAPHICS, PRACTICE CHARACTERISTICS, AND HEALTH CARE OUTCOMES BETWEEN PATIENTS WITH FREQUENT MISSED APPOINTMENTS AND THE REMAINDER OF THE STUDY SAMPLE

	Frequent Missed Appointments (n = 228) <sup>a</sup>	Non-Frequent Missed Appointments (n = 422)	P
Age, y, mean ± SD	50.4 ± 6.1	52.1 ± 4.6	.28
Female, No. (%)	95 (41.7)	178 (42.2)	.37
No. of PCIM visits	1875	4412	<.001
No. of emergency department visits, mean ± SD	5.1 ± 1.3	1.1 ± 0.6	<.001
No. of hospitalizations, mean ± SD	1.0 ± 2.3	0.9 ± 1.9	.68
No. of active prescriptions, mean ± SD	5.1 ± 3.2	5.0 ± 2.8	.24
Proportion of office visits with assigned primary care provider, %	58.7	71.1	<.001
Use of interpreter, %	30.3	4.7	.16
Duration in PCIM clinic, y, mean ± SD	1.8 ± 3.7	10.2 ± 2.8	<.001
Medicaid insurance, %	36.8	4.7	<.001
Patient not up to date with preventative services, % <sup>b</sup>	46.1	23.9	<.001
Patients with poorly controlled diabetes, % <sup>c</sup>	62.9	7.1	<.001
Patients with poorly controlled blood pressure, % <sup>d</sup>	63.6	27.7	<.001

Abbreviation: PCIM, primary care internal medicine.

<sup>a</sup>Patients who missed appointments ≥20% of the time or had ≥5 missed appointments during the study interval.

<sup>b</sup>Age-appropriate preventative services defined as screening abdominal aortic aneurysm in ever-smoking men ages 65 to 75 years; screening breast cancer with mammography in women ages >40 years; screening for colorectal cancer in adults ages >50 years; screening for cervical cancer with Pap smear in women ages <65 years who are sexually active and have a cervix; screening for hyperlipidemia in men ages >35 years and women >45 years; screening for chlamydia/gonorrhea in women age 25 years or younger or high risk. Lacking at least 2 preventative services as of December 2008 was defined as not being up to date.

<sup>c</sup>Poorly controlled diabetes was defined as having at least 2 HgA1c >7% during time period 2006–2008.

<sup>d</sup>Poorly controlled blood pressure was defined as having at least 2 separate systolic pressures ≥160 and/or diastolic pressures ≥100.

## Results

### Comparison of Missed Appointments Between Resident and Faculty Patients

Resident patients demonstrated significantly higher rates of missed appointments than faculty patients (TABLE 1). Resident patients were younger than faculty patients, more likely to have Medicaid insurance, and more likely to require a medical interpreter. Resident patients' office visits were less likely to be with their primary care provider than faculty patients' visits, and resident patients were more likely to have a shorter affiliation with the PCIM clinic. Resident patients had more emergency department visits during the study interval, but the number of hospitalizations and number of active prescriptions were statistically similar between the 2 groups (TABLE 1).

### Associations Between Patient Characteristics and Missed Appointments

Patient factors associated with higher frequency of missed appointments included use of a medical interpreter, Medicaid insurance, and more frequent emergency department visits (TABLE 2). Patient factors associated with lower frequency of missed appointments included

longer affiliation with the PCIM clinic and higher proportion of office visits with the primary care provider (TABLE 2). After adjustment for the above, there was no difference in rates of missed appointments between the resident and faculty practices (TABLE 3).

### Associations Between Missed Appointments and Health Outcomes

Of the 650 patients in the study, 228 (35%) were identified as those with frequent missed appointments (missed appointments ≥20% of the time or ≥5 missed appointments during the study interval; TABLE 2). These patients were less likely to be up to date with age-appropriate preventive health services. Among the 166 patients with a diagnosis of diabetes, patients with frequent missed appointments were more likely to have HgA1c >7. Finally, among 279 patients with a diagnosis of hypertension, patients with frequent missed appointments were more likely to have poor blood pressure control (TABLE 4).

## Discussion

Despite sharing similar clinical practice parameters and allied health staff, the resident practice had a much higher

**TABLE 3** **MULTIPLE LINEAR REGRESSION MODEL PREDICTING FREQUENCY OF MISSED APPOINTMENTS (N = 650; ADJUSTED  $R^2 = 0.64$ )**

	$\beta$ Coefficient	Standard Error	P
Age	−0.011	0.023	.62
Women	1.243	0.022	.58
No. of ED visits between 2006 and 2008	0.820	0.040	<.001
No. of hospitalizations between 2006 and 2008	0.001	0.002	.59
No. of active prescriptions between 2006 and 2008	0.048	0.016	.49
Proportion of office visits with assigned primary care provider (%)	−3.652	0.355	.02
Use of interpreter	0.124	0.011	<.001
Years in PCIM clinic	−0.401	0.01	<.001
Medicaid insurance	2.299	1.158	<.001
Faculty/resident panel	0.115	0.012	.32

Abbreviations: ED, emergency department; PCIM, primary care internal medicine.

rate of missed appointments compared with the faculty practice. The high rate of missed appointments in resident continuity clinic is consistent with previous reports, but the comparison with a faculty practice adds to the literature by demonstrating that the difference in missed appointments between the 2 practices is explained by patient factors. Differences in patient characteristics between resident and faculty practices are well documented nationally, such that socioeconomic position of resident patients tends to be lower than for faculty practice patients.<sup>15–17</sup> The reasons for these discrepancies are not clear, but may include the notion that faculty practices are more likely to be at capacity, thereby shifting new and less socioeconomically stable patients to resident panels. Further, patients with higher

socioeconomic position may be more likely to request a faculty provider.

It is essential that clinic support for these patients and their resident providers are optimized. First, support for comprehensive outpatient care (eg, allied health staff services) should be equally robust between the resident and faculty practices.<sup>18</sup> Second, resident continuity clinic redesign should maximize access to and utilization of evidence-based multidisciplinary models of care for their patients (eg, medical home).<sup>19</sup> Finally, resident education and mentorship regarding the care of vulnerable populations should permeate the continuity clinic experience,<sup>20,21</sup> particularly in the context of low knowledge among residents about factors affecting underserved

**TABLE 4** **HEALTH CARE OUTCOMES OF PATIENTS WITH FREQUENT MISSED APPOINTMENTS**

	Hazard Ratio for Suboptimal Outcomes (95% CI) <sup>a</sup>	P
Patient not up to date with preventative services <sup>b</sup>	1.94 (1.35, 2.80)	<.001
Patients with poorly controlled diabetes <sup>c</sup>	4.80 (2.41, 9.56)	<.001
Patients with poorly controlled blood pressure <sup>d</sup>	4.36 (2.55, 7.44)	<.001

Abbreviation: CI, confidence interval.

<sup>a</sup> Frequent missed appointments group relative to remainder of the study sample.

<sup>b</sup> Age-appropriate preventative services defined as screening abdominal aortic aneurysm in ever-smoking men ages 65 to 75 years; screening breast cancer with mammography in women ages >40 years; screening for colorectal cancer in adults ages >50 years; screening for cervical cancer with Pap smear in women ages <65 years who are sexually active and have a cervix; screening for hyperlipidemia in men ages >35 years and women >45 years; screening for chlamydia/gonorrhea in women age 25 years or younger or high risk. Lacking at least 2 preventative services as of December 2008 was defined as not being up to date.

<sup>c</sup> Poor diabetic control was defined as having at least 2 HgbA1c >7% during time period 2006–2008.

<sup>d</sup> Poorly controlled blood pressure was defined as having at least 2 separate systolic pressures  $\geq 160$  and/or diastolic pressures  $\geq 100$ .

patients<sup>22</sup> and waning attitudes toward these populations as training proceeds.<sup>23</sup>

Consistent with prior reports,<sup>7–10</sup> our study demonstrated that patients who required an interpreter and have government-provided health insurance missed more appointments to continuity clinic. Our study adds to this literature by demonstrating that patients with frequent missed appointments are less likely to have a long-term relationship with their primary care practice, have a lower proportion of visits with their own physician, and are more likely to visit the emergency department. Barriers to completing medical appointments among these patient populations have been inadequately explored in the literature. Qualitative studies among patients who frequently miss appointments have identified transportation, wait times, not knowing the reason for the appointment, competing priorities, inefficiencies with the booking system, and perceived disrespect as barriers to keeping appointments.<sup>9,10</sup>

Interventions with success at reducing rates of missed appointments include reminders through mail and phone,<sup>24,25</sup> text message reminders,<sup>26</sup> and orientation to the clinic.<sup>27</sup> Testing of interventions aimed specifically at improving rates of missed appointments in resident continuity clinic is needed. In addition to reminder mechanisms, our findings suggest that recent trends toward redesign of resident continuity clinic practices aimed at enhancing provider or team continuity with patients may reduce rates of missed appointments.<sup>28</sup>

We found that patients with frequent missed appointments were less likely to have received preventive health services and more likely to have poorly controlled hypertension and diabetes. Two earlier studies also correlated missed appointments with worse glycemic control and medication adherence among patients with diabetes.<sup>29,30</sup> Although these associations are not likely to be causal, a high rate of missed appointments may serve as a useful barometer of barriers to self-care. This easily measured variable may help identify patients most likely to benefit from case management. Prior attempts to identify patients for case management have focused on surrogates for medical complexity (eg, age, number of active medications, number of diagnoses, etc).<sup>31,32</sup> This may leave out socioeconomically disadvantaged patients with chronic illness who may benefit from case management to remove barriers to keeping appointments and adhering to treatment plans.

Limitations of our study include its retrospective, observational nature, and the availability of particular variables for analysis. Causality among variables cannot be implied. Our single-center findings may not be generalized to other academic practices. Although differences in resident and faculty practice demographics are consistent with other reports, the rate of missed appointments in our sample is lower than in previous studies.

## Conclusion

We found that the disproportionate frequency of missed appointments in resident continuity clinic is explained by patient factors and practice continuity, and that a high rate of missed appointments predicts worse health care outcomes. These findings emphasize the importance of further exploratory studies aimed at identifying barriers to attending appointments and testing of interventions at the level of residents, patients, and continuity clinic systems to further address these behaviors.

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